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EXAMINER	
GUILL, RUSSELL L	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 11/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/865,732	YAMAGUCHI ET AL.	
	Examiner	**Art Unit**	
	Russell L. Guill	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 16 August 2005.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 29 May 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the Amendment filed August 16, 2005. Applicants amended claims 1 and 5 - 12. No new claims have been added. No claims have been canceled. Claims 1 – 12 have been examined. Claims 1 – 12 have been rejected.

Response to Applicant's Remarks

2. Regarding **claims 8 – 9 and 11 – 12** that were rejected under 35 U.S.C. 101, the Applicant's amendments overcome the rejection for claims 9 and 11 – 12. Claim 8 remains directed to a propagation signal, which is non-statutory because it is an intangible element that is not a process, machine, manufacture or composition of matter. Accordingly, the rejection is maintained.

3. Regarding **claim 11**, rejected under 35 U.S.C. 102, the Applicant's arguments have been considered, but are moot in view of new grounds of rejection.

3.1. The Applicant argues that the Cheng reference does not apply to any object but only to one particular type of object, antennas. The claim is directed to any object. The Examiner replies that an antenna is any object for radiating or receiving radio waves, which is any object attached to a voltage source. Therefore, the Cheng reference applies to any object.

3.2. The Applicant argues that Cheng does not teach, "storing the current values as constants." The Applicant notes that equation 11-104 of the Cheng reference discloses the computation of the antenna current (I_2) based upon the impedance coefficients (Z_{21}, Z_{22}, Z_L) and the transmitter current (I_1). The Applicant argues that given the intrinsic property nature of the impedance coefficients, the impedance coefficients are constant values, and the transmitter current must represent a variable. Therefore, if the implication argued by the Examiner is correct, that Cheng appears to teach storing current values as constants, then the antenna current is also a constant value, and if the antenna current is also a constant value, then there is no

need to calculate the antenna current repeatedly. The Examiner replies that the coupling impedance between the antennas (Z_{21}) is not a constant when the relative position of the antennas is changed, and therefore the antenna current in the receiving antenna would also change. Cheng also teaches evaluating a pair of coupled antennas in multiple relative positions (page 632, figure 11-16). Further, the load impedance (Z_L) is also subject to change.

3.3. The Applicant argues that the Cheng reference does not teach or suggest the "outputting the receiving characteristic of the object on an output device." The Examiner replies that this limitation is the amendment to the claim, and is addressed with new art.

3.4. The Applicant argues that the Cheng reference does not teach the separation of the wave generation source and the object simultaneous moment equations. It is noted that the preceding features upon which Applicant relies (i.e. separation of the wave generation source and the object simultaneous moment equations), are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns,* 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

3.5. The Applicant argues that the Cheng reference does not contemplate the computational issues dealt with by the present invention since the Cheng reference does not envision the use of the moment method. It is noted that the preceding features upon which Applicant relies (i.e. moment method), are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns,* 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

3.6. Accordingly, as discussed above, the rejection is maintained.

4. Regarding **claims 1, 5, 7, 8, 9 and 10** rejected under 35 U.S.C. 103, under the heading, the prior art does not teach or suggest a current storage device storing the current values of the generation source.

4.1. The Applicant argues that the Nishino reference, FIG. 5 teaches contemporaneous use of current values, rather than current storage. The Examiner replies that, since the calculations in Nishino are performed in a computer, there is an implied teaching of storage of current values in FIG. 5 between elements ST5 and ST7, at least in the memory or registers of the computer. Since computer memory and registers are storage devices, Nishino teaches a current storage device storing the current values of the generation source.

4.2. The Applicant also argues that Nishino does not teach storage of wave source current values in storage devices 20 and 21 of FIG. 5. Since the Examiner did not rely upon the storage of wave source current values in storage devices 20 and 21 of FIG. 5, the argument is not relevant to the claims.

4.3. The Applicant also argues that Nishino does not teach the storage of current values in the Specification. Since the Examiner did not rely upon the teaching of the Specification, the argument is not relevant to the claims.

4.4. The Applicant also argues that similar to FIG. 5, FIG. 4 elements 12 and 13 do not teach current storage. The Examiner replies that, since the calculations in Nishino are performed in a computer, there is an implied teaching of storage of current values in FIG. 4 between elements 12 and 13, at least in the memory or registers of the computer. Since computer memory and registers are storage devices, Nishino teaches a current storage device storing the current values of the generation source.

4.5. Accordingly, as discussed above, the rejections are maintained.

5. Regarding **Dependents of Claim 1**,

5.1. The Applicant argues that none of the cited references teach:

5.1.1. "a matrix storage device storing matrix data of mutual impedance between elements of the object" as set forth in claim 2.

5.1.2. "generates simultaneous equations of the object corresponding to the new position using the matrix data stored in the matrix storage device as a coefficient matrix and calculates a new current values" as set forth in claim 2.

5.1.3. "said matrix storage device stores matrix data of a factorized coefficient matrix" as set forth in claim 3.

5.1.4. "a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used" as set forth in claim 4.

5.2. The Examiner replies:

5.2.1. Regarding "a matrix storage device storing matrix data of mutual impedance between elements of the object" as set forth in claim 2: as described in the action, this limitation is taught in Nishino in Figure 5, elements ST6 and ST7.

5.2.2. Regarding "generates simultaneous equations of the object corresponding to the new position using the matrix data stored in the matrix storage device as a coefficient matrix and calculates a new current values" as set forth in claim 2:

5.2.2.1. Nishino teaches "generates simultaneous equations of the object using the matrix data stored in the matrix storage device as a coefficient matrix (**Figure 5, elements ST6 and ST7; and column 10, lines 56 – 64**) and calculates a new current values (**Figure 5, element ST7; and column 10, lines 56 – 64**)."

5.2.2.2. Nishino also teaches "a receiving characteristic being calculated at multiple positional relationships from the generation source (**figure 5, elements ST8, ST9, and 21; and column 11, lines 22 – 36**). Regarding (**figure 5, elements ST8, ST9, and 21; and column 11, lines 22 – 36**),

since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

5.2.2.3. Further, Cheng teaches multiple positional relationships between electromagnetically coupled objects (**page 632, figure 11-16**).

5.2.2.4. It would have been obvious to: "generates simultaneous equations of the object ***corresponding to the new position*** using the matrix data stored in the matrix storage device as a coefficient matrix and calculates a new current values."

5.2.3. Regarding "said matrix storage device stores matrix data of a factorized coefficient matrix" as set forth in claim 3:

5.2.3.1. In Nishino, **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it is obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object (Figure 5, element ST7). Since the calculations in Nishino are performed in a computer, there is an implied teaching of storage of matrix data of mutual impedance in FIG. 5 between elements ST6 and ST7, at least in the memory or registers of the computer. Since computer memory and registers are storage devices, Nishino teaches a matrix storage device storing matrix data of mutual impedance between elements of an object. Further, as recited in the action, Lay teaches factorizing a coefficient matrix (Section 2.5 Matrix Factorizations, page 133), and it would have been obvious to an ordinary artisan at the time of invention to use the art of Lay with the art of Nishino to

produce a matrix storage device that stores matrix data of a factorized coefficient matrix.

5.2.4. Regarding "a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used" as set forth in claim 4:

5.2.4.1. Nishino teaches a judging device (**figure 5, element ST3; and column 9, lines 20 - 23**).

5.2.4.2. Cheng teaches that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna.

5.2.4.3. It would have been obvious to have: "a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used."

6. Regarding **claims 1 and 5 - 10** rejected under 35 U.S.C. 103, under the heading, the prior art does not teach or suggest wherein simultaneous equations of the radio wave generation source . . . are separately calculated.

6.1. The Applicant argues that inherent within the claims is that the separately calculated simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are based on the moment method. It is noted that the preceding features upon which Applicant relies, are not recited in the rejected claim(s).

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The remaining statements by the Applicant in the section, are all regarding the moment method, which is not recited in the rejected claims. Accordingly, the rejections are maintained.

7. Regarding **claims 2, 3 and 5** rejected under 35 U.S.C. 103, under the heading, the prior art does not teach or suggest a matrix storage device storing matrix data of mutual impedance.

7.1. The Applicant argues that Nishino does not teach:

7.1.1. "a matrix storage device storing matrix data of mutual impedance between elements of the object" as set forth in claim 2.

7.1.2. "said matrix storage device stores matrix data of a factorized coefficient matrix" as set forth in claim 3.

7.1.3. "a matrix storage device storing matrix data of mutual impedance between elements of the object when the object is divided into a plurality of elements" as set forth in claim 5.

7.2. The Examiner replies, that as recited in the action, in Nishino, **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it is obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object (Figure 5, element ST7). Since the calculations in Nishino are performed in a computer, there is an implied teaching of storage of matrix data of mutual impedance in FIG. 5 between elements ST6 and ST7, at least in the memory or registers of the computer. Since computer memory and registers are storage devices, Nishino teaches a matrix storage

device storing matrix data of mutual impedance between elements of an object. Further, as recited in the action, Lay teaches factorizing a coefficient matrix (Section 2.5 Matrix Factorizations, page 133), and it would have been obvious to an ordinary artisan at the time of invention to use the art of Lay with the art of Nishino to produce a matrix storage device that stores matrix data of a factorized coefficient matrix.

7.3. Further, the Applicant argues that:

7.3.1. Nishino teaches two discrete storage devices, FIG. 5, elements 20 and 21.

7.3.2. Nishino teaches the storage of only structural information and results of the calculation of the intensity of the electromagnetic field.

7.3.3. Nishino does not suggest or teach the storage of any information to enable subsequent computation.

7.3.4. Nishino teaches contemporaneous use of the calculated current of the wave source in solving the current of the inapplicable areas.

7.4. The Examiner replies:

7.4.1. Regarding that Nishino teaches two discrete storage devices, FIG. 5, elements 20 and 21: as discussed above, there is an implied teaching of storage of matrix data of mutual impedance in Nishino in FIG. 5 between elements ST6 and ST7, at least in the memory or registers of the computer.

7.4.2. Regarding that Nishino teaches the storage of only structural information and results of the calculation of the intensity of the electromagnetic field: as discussed above, there is an implied teaching of storage of matrix data of mutual impedance in Nishino in FIG. 5 between elements ST6 and ST7, at least in the memory or registers of the computer.

7.4.3. Regarding that Nishino does not suggest or teach the storage of any information to enable subsequent computation: as discussed above, there is an implied teaching of storage of matrix data of mutual impedance in Nishino in FIG. 5 between

elements ST6 and ST7, at least in the memory or registers of the computer. The mutual impedance is used in a following calculation in element ST7.

7.4.4. Regarding that Nishino teaches contemporaneous use of the calculated current of the wave source in solving the current of the inapplicable areas: as discussed above, there is an implied teaching of storage of matrix data of mutual impedance in Nishino in FIG. 5 between elements ST6 and ST7, at least in the memory or registers of the computer.

7.4.5. Accordingly, as discussed above, the rejections are maintained.

8. Regarding **claim 6** rejected under 35 U.S.C. 103, under the heading, the prior art does not teach or suggest an mutual impedance storage device.

8.1. The Applicant argues that Otsu does not teach "an impedance storage device" for storage of the mutual impedance data for the object and the wave generation source. The Applicant also notes that the examiner cites Otsu as teaching this feature by arguing that the feature is obvious in view of FIG. 45.

8.2. The Examiner replies, that in **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**, since the impedance calculated in the box labeled "calculation of mutual impedance" is used in the box labeled "simultaneous equation for calculation of current", it is obvious that an impedance storage device is used between the two boxes. Further, since the calculations in Otsu are performed in a computer, there is an implied teaching of storage of mutual impedance in FIG. 45 between **boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**, at least in the memory or registers of the computer. Since computer memory and registers are storage devices, Otsu teaches an impedance storage device for storage of the mutual impedance data for the object and the wave generation source.

8.3. Accordingly, as discussed above, the rejection is maintained.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claim 8 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. A propagation signal is not a process, machine, manufacture, or a composition of matter.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claim 1 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

12.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

12.2. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

12.2.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

12.3. Nishino further teaches a current storage device storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

12.3.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the generation source.

12.4. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing** (refer to following subsection)) by a second current calculation device calculating current values of the object (**Figure 4, element 13**, and **column 7, lines 10 – 12**, and **Figure 5, element ST7**, and **column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

12.4.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

12.5. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object **(Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36)**, the receiving characteristic being calculated at multiple positional relationships from the generation source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

12.5.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

12.5.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

12.6. Nishino does not teach expressly *a simulation apparatus*.

12.7. Nishino does not teach expressly a first current calculation device calculating current values of a radio wave generation source *using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

12.8. Nishino also does not teach expressly a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements *and a positional relationship between the generation source and object changes*, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

12.9. Nishino also does not teach expressly that *simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated*.

12.10. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

12.11. Otsu teaches a simulation apparatus (**column 23, line 31**).

12.12. Otsu further teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

12.12.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

12.13. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

12.14. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the receiving characteristic of the object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

12.15. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

12.16. Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

12.17. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

12.18. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the current values stored in the current storage device as constants.

12.19. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce an output device calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object.

12.20. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (page 634, figure 11-18).

12.21. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 1.

13. Claim 2 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) and Otsu et al (U.S. Patent 5,903,477) and Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

13.1. Claim 2 is subordinate to claim 1, and therefore inherits all the limitations of claim 1.

13.2. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

13.3. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

13.3.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

13.4. Nishino further teaches a current storage device storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

13.4.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the generation source.

13.5. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) by a second current calculation device calculating current values of the object (**Figure 4, element 13**, and **column 7, lines 10 – 12**, and **Figure 5, element ST7**, and **column 11, lines 19- 21**)

using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

13.5.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

13.6. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**), the receiving characteristic being calculated at multiple positional relationships from the generation source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

13.6.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

13.6.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

13.7. Nishino further teaches that the second current calculating device includes a device calculating mutual impedance between elements of the object (**Figure 4, elements 13 and 130**, and **column 6, lines 53 – 55**), a device calculating mutual impedance between an element of the generation source and an element of the object (**Figure 4, elements 13 and 130**, and **column 6, lines 53 – 57**) and a matrix storage device

storing matrix data of mutual impedance between elements of the object (**Figure 5, elements ST6 and ST7**(refer to following subsection)), generates simultaneous equations of the object using the matrix data stored in the matrix storage device as a coefficient matrix (**Figure 5, elements ST6 and ST7** and **column 10, lines 56 – 64**) and calculates new current values (**Figure 5, element ST7** and **column 10, lines 56 – 64**).

13.7.1. Regarding **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it is obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object (Figure 5, element ST7).

13.8. Nishino does not expressly teach _a simulation apparatus_.

13.9. Nishino does not teach expressly a first current calculation device calculating current values of a radio wave generation source _using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns_.

13.10. Nishino also does not teach expressly a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements _and a positional relationship between the generation source and object changes_, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

13.11. Nishino also does not teach expressly that the second current calculating device includes a device calculating mutual impedance between elements of the object, a device calculating mutual impedance between an element of the generation source and an element of the object and a matrix storage device storing matrix data of mutual impedance between elements of the object, *calculates mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes*, generates simultaneous equations of the object *corresponding to the new position* using the matrix data stored in the matrix storage device as a coefficient matrix and calculates new current values.

13.12. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

13.13. Otsu teaches a simulation apparatus (**column 23, line 31**).

13.14. Otsu further teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (column 5, lines 54 – 58, and Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (column 5, lines 54 – 58, and Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"). It was well known that in the moment method, a generation source is divided into a plurality of elements.

13.15. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

13.16. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

13.17. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the current values stored in the current storage device as constants.

13.18. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce an output device calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object.

13.19. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (**page 634, figure 11-18**).

13.20. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 2.

14. Claim 3 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) and Otsu et al (U.S. Patent 5,903,477) and Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng) in view of Lay ("Linear Algebra and Its Applications", 1997, David C. Lay).

14.1. Claim 3 is subordinate to claim 2, and therefore inherits all the limitations of claim 2.

14.2. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

14.3. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

14.3.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

14.4. Nishino further teaches a current storage device storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

14.4.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the generation source.

14.5. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) by a second current calculation device calculating current values of the object (**Figure 4, element 13**, and **column 7, lines 10 – 12**, and **Figure 5, element ST7**, and **column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

14.5.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

14.6. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36)**, the receiving

characteristic being calculated at multiple positional relationships from the generation source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 - 36**).

14.6.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

14.6.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

14.7. Nishino further teaches that the second current calculating device includes a device calculating mutual impedance between elements of the object (**Figure 4, elements 13 and 130**, and **column 6, lines 53 - 55**), a device calculating mutual impedance between an element of the generation source and an element of the object (**Figure 4, elements 13 and 130**, and **column 6, lines 53 - 57**) and a matrix storage device storing matrix data of mutual impedance between elements of the object (**Figure 5, elements ST6 and ST7**(refer to following subsection)), generates simultaneous equations of the object using the matrix data stored in the matrix storage device as a coefficient matrix (**Figure 5, elements ST6 and ST7** and **column 10, lines 56 - 64**) and calculates new current values (**Figure 5, element ST7** and **column 10, lines 56 - 64**).

14.7.1. Regarding **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it is obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object.

14.8. Nishino does not teach expressly _a simulation apparatus_.

14.9. Nishino also does not teach expressly a first current calculation device calculating current values of a radio wave generation source _using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns_.

14.10. Nishino also does not teach expressly a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements _and a positional relationship between the generation source and object changes_, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

14.11. Nishino also does not teach expressly that the second current calculating device includes a device calculating mutual impedance between elements of the object, a device calculating mutual impedance between an element of the generation source and an element of the object and a matrix storage device storing matrix data of mutual impedance between elements of the object, _calculates mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes,_ generates simultaneous equations of the object _corresponding to the new position_ using the matrix data stored in the matrix storage device as a coefficient matrix and calculates new current values.

14.12. Nishino also does not teach expressly that *the second current calculation device further includes a factorization device factorizing the coefficient matrix by a prescribed factorization method and said matrix storage device stores matrix data of a factorized coefficient matrix.*

14.13. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

14.14. Otsu teaches a simulation apparatus (**column 23, line 31**).

14.15. Otsu further teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**). It was well known that in the moment method, a generation source is divided into a plurality of elements.

14.16. Lay teaches that the LU factorization is motivated by the fairly common industrial problem of solving a sequence of simultaneous equations, all with the same coefficient matrix (Section 2.5 Matrix Factorizations, page 133):

$Ax = b1, \quad Ax = b2, \quad Ax = b3, \ldots$

It was commonly known by an artisan of ordinary skill in the art at the time of invention that LU factorization is useful for solving a sequence of simultaneous equations, all with the same coefficient matrix (Section 2.5 Matrix Factorizations, page 133).

14.17. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device. Nishino and Lay are analogous art because they are directed to a similar problem solving area, that of calculating solutions to sequences simultaneous equations, all with the same coefficient matrix.

14.18. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Nishino to produce a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

14.19. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Nishino to produce a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the current values stored in the current storage device as constants.

14.20. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Nishino to produce an output device calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object.

14.21. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu, Nishino, and Lay to produce a second current calculation device that further includes a factorization device factorizing the coefficient matrix by a prescribed factorization method and said matrix storage device stores matrix data of a factorized coefficient matrix.

14.22. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit.

14.23. The motivation for combining the art of Otsu, Nishino and Lay would have been the common knowledge of an artisan of ordinary skill in the art that LU factorization is useful to solve sequences of simultaneous equations, all with the same coefficient matrix, by providing reduced calculation time, which would have provided the expectation of a computational benefit.

14.24. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng and the art of Lay with the art of Nishino for the benefit of obtaining the invention as specified in claim 3.

15. Claim 4 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) and Otsu et al (U.S. Patent 5,903,477), and Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

15.1. Claim 4 is subordinate to claim 1, and therefore inherits all the limitations of claim 1.

15.2. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

15.3. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

15.3.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

15.4. Nishino further teaches a current storage device storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

15.4.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the generation source.

15.5. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) by a second current calculation device calculating current values of the object (**Figure 4, element 13**, and **column 7, lines 10 – 12**, and **Figure 5, element ST7**, and **column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

15.5.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

15.6. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36)**, the receiving characteristic being calculated at multiple positional relationships from the generation source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

15.6.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

15.6.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

15.7. Nishino further teaches a judging device that determines whether the electronic circuit device includes the applicable sections for the distributed constant circuit method or the applicable sections for the moment method (**Figure 5, element ST3**, and **column 9, lines 20 – 23**).

15.8. Nishino does not teach expressly *a simulation apparatus*.

15.9. Nishino also does not teach expressly a first current calculation device calculating current values of a radio wave generation source *using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

15.10. Nishino also does not teach expressly a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements *and a positional relationship between the generation source and object changes*, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

15.11. Nishino also does not teach expressly a judging device *judging whether a calculation method in which the current values of the generation source are regarded as constants can be used, wherein said second current calculation device calculates the current values of the object using the simultaneous equations of the object if the calculation method can be used*.

15.12. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

15.13. Otsu teaches a simulation apparatus (**column 23, line 31**).

15.14. Otsu also teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

15.14.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

15.15. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna.

15.16. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic

device. Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

15.17. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

15.18. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the current values stored in the current storage device as constants.

15.19. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce an output device calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object.

15.20. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu, Cheng and Nishino to produce a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used, wherein said second current calculation device calculates the current values of the object using the simultaneous equations of the object if the calculation method can be used.

15.21. The motivation for combining the art of Otsu and Cheng with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit, and the limitation stated in Cheng that the transmitting and receiving antennas need to be separated by large distances in order to have negligibly small coupling impedances as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna.

15.22. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 4.

16. Claim 5 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

16.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

16.2. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a transmitting antenna (**column 7, lines 16 – 20**).

16.2.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a transmitting antenna.

16.3. Nishino further teaches a current storage device storing the current values of the transmitting antenna (**Figure 5, element ST7** (refer to following subsection)).

16.3.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the transmitting antenna.

16.4. Nishino further teaches a matrix storage device storing matrix data of mutual impedance between elements of the object when the object is divided into a plurality of elements (**Figure 5, elements ST6 and ST7**(refer to following subsection), and **column 10, lines 46 – 49**).

16.4.1. Regarding **Figure 5, elements ST6 and ST7**, since the process flow in Figure 5 displays that the calculated matrix data of mutual impedance between elements of the object in element ST6 are used in the calculations of element ST7, it is obvious that a matrix storage device is included that stores the matrix data of mutual impedance between elements of the object.

16.5. Nishino further teaches a device calculating mutual impedance between an element of the transmitting antenna and an element of the object (**Figure 4, elements 13 and 130**, and **column 6, lines 53 – 57**).

16.6. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) by a second current calculation device (**Figure 4, element 13**, and **column 6, line 52**) generating simultaneous equations of the object using currents that flow through respective elements of the object as unknowns (**Figure 4, element ST**, and **column 10, lines 56 – 64**), matrix data stored in the matrix storage device as a coefficient matrix (**Figure 4, element ST**, and **column 10, lines 56 – 64**) and both the current values stored in the current storage device and the mutual impedance between the element of the transmitting antenna and the element of the object as constants (**Figure 4, element ST**, and **column 10, lines 56 – 64**), and calculating current values of the object (**Figure 4, element ST**, and **column 10, lines 56 – 64**).

16.7. Nishino further teaches a device calculating the directivity characteristic of the object based on the current values of the object (**Figure 5, element ST7**, and **column 10, lines 56 – 62**(refer to the following subsection)).

16.7.1. Regarding **Column 10, lines 56 – 62**, the calculated currents are the directivity characteristic of the object.

16.8. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**), the receiving characteristic being calculated at multiple positional relationships from the

transmitting antenna, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

16.8.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

16.8.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the transmitting antenna.

16.9. Nishino does not teach expressly *a simulation apparatus*.

16.10. Nishino also does not teach expressly a first current calculation device calculating current values of a transmitting antenna *using simultaneous equations of the transmitting antenna when the transmitting antenna is divided into a plurality of elements, the simultaneous equations of the transmitting antenna having currents that flow through respective elements as unknowns*.

16.11. Nishino also does not teach expressly a device calculating mutual impedance between an element of the transmitting antenna and an element of the object *for each angle of the transmitting antenna against the object.*

16.12. Nishino also does not teach expressly a calculation of currents in an object that receives a radio wave by a second current calculation device generating simultaneous equations of the object *for each angle of the transmitting antenna* using currents that flow through respective elements of the object as unknowns, matrix data stored in the matrix storage device as a coefficient matrix and both the current values stored in the current storage device and the mutual impedance between the element of the

transmitting antenna and the element of the object as constants, and calculating current values of the object.

16.13. Nishino also does not teach expressly an *output* device calculating the *directivity* characteristic of the object based on the current values of the object and outputting the *directivity* characteristic of the object.

16.14. Nishino also does not teach expressly that *simultaneous equations of the radio wave transmitted from the transmitting antenna and the simultaneous equations of the directivity characteristic of the object are separated by regarding the current values of the radio wave transmitted from the transmitting antenna as constants, and the current values of the radio wave transmitted from the transmitting antenna and the current values of the directivity characteristic of the object are separately calculated.*

16.15. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

16.16. Otsu teaches a simulation apparatus (**column 23, line 31**).

16.17. Otsu also teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 60**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance"**

and "simultaneous equation for calculation of current"). It was well known that in the moment method, a generation source is divided into a plurality of elements.

16.17.1. Regarding **column 5, lines 54 – 60**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current",** since the calculated currents are used to calculate an intensity of radiation of an electromagnetic field, it is obvious that the device is a transmitting antenna.

16.18. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

16.19. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the directivity characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

16.20. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

16.21. Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

16.22. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a first current calculation device calculating current values of the transmitting antenna using simultaneous equations of the transmitting antenna when the transmitting antenna is divided into a plurality of elements, the simultaneous equations of the transmitting antenna having currents that flow through respective elements as unknowns.

16.23. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a device calculating mutual impedance between an element of the transmitting antenna and an element of the object for each angle of the transmitting antenna against the object.

16.24. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a second current calculation device generating simultaneous equations of the object for each angle of the transmitting antenna using currents that flow through respective elements of the object as unknowns, matrix data stored in the matrix storage device as a coefficient matrix and both the current values stored in the current storage device and the mutual impedance between the element of the transmitting antenna and the element of the object as constants, and calculating current values of the object.

16.25. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce an output device calculating the directivity characteristic of the object based on the current values of the object and outputting the directivity characteristic of the object.

16.26. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (**page 634, figure 11-18**).

16.27. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 5.

17. Claim 6 is rejected under 35 U.S.C. 103(a) as being obvious over Otsu et al (U.S. Patent 5,903,477) in view of Miller (Edmund K. Miller, "A Selective Survey of Computational Electromagnetics", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, VOL. 36, No. 9), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

17.1. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

17.2. Otsu teaches a simulation apparatus (**column 23, line 31**).

17.3. Otsu also teaches an impedance storage device storing data of mutual impedance between elements of a radio wave generation source when the generation source is divided into a plurality of elements (**Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**, and **column 5, lines 54 – 58**).

17.3.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

17.3.2. Regarding **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**, since the impedance calculated in the box labeled "calculation of mutual impedance" is used in the box labeled "simultaneous equation for calculation of current", it is obvious that an impedance storage device is used.

17.4. Otsu teaches a current calculation device calculating current values using simultaneous equations having currents that flow through respective elements of the generation source as unknowns and having a matrix consisting of the data stored in the impedance storage device (**Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**, and **column 5, lines 54 – 58**).

17.5. Otsu teaches an output device calculating the electric field and magnetic field of the generation source based on the current values and outputting the electric field and

magnetic field (**Figure 45, box labeled "calculation of electric field and magnetic field", and symbol labeled "output data"**, and **column 5, lines 54 – 60**).

17.6. Otsu does not explicitly teach an impedance storage device storing *both* data of mutual impedance between elements of the generation source when the generation source is divided into a plurality of elements *and data of mutual impedance between elements of an object that receives a radio wave when the object is divided into a plurality of elements as data independent from a position of the generation source*.

17.7. Otsu does not explicitly teach *a device calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when the position the generation source changes*.

17.8. Otsu does not explicitly teach an output device *calculating the receiving characteristic of the object* based on the current values *and outputting the receiving characteristic of object*.

17.9. Otsu does not explicitly teach that *the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated.*

17.10. The art of Miller is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

17.11. Miller teaches that, when an antenna may be evaluated in several positions, it is computationally advantageous to partition the impedance matrix into pieces representing the antenna, the other structure, and their mutual interaction pieces (**Miller, page 1299, section c**)).

17.12. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

17.13. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the directivity characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

17.14. Otsu and Cheng are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

17.15. Otsu and Miller are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

17.16. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Miller to produce an impedance storage device storing both data of mutual impedance between elements of the generation source when the generation source is divided into a plurality of elements and data of mutual impedance between elements of the object when the object is divided into a plurality of elements as data independent from a position of the generation source.

17.17. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Miller to produce a device calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when the position the generation source changes.

17.18. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Miller to produce a current calculation device calculating current values using simultaneous equations having currents that flow through respective elements of both the generation source and object as unknowns and having a matrix consisting of the data stored in the impedance storage device and the mutual impedance between the element of the generation source and the element the object as a coefficient matrix.

17.19. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Miller to produce an output device calculating the receiving characteristic of the object based on the current values and outputting the receiving characteristic of object.

17.20. The motivation for combining the art of Otsu with the art of Miller would have been obvious in view of the suggestion in Miller of a computational advantage to partition the impedance matrix when an antenna must be evaluated in different positions (Miller, page 1299, section c)).

17.21. The motivation for combining the art of Cheng with the art of Otsu would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (page 634, figure 11-18).

17.22. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Miller and the art of Cheng with the art of Otsu for the benefit of obtaining the invention as specified in claim 6.

18. Claim 7 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

18.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

18.2. Nishino teaches a memory medium storing a computer program (**column 30, line11**).

18.2.1. Regarding **column 30, line11**, it is obvious that the medium is computer-readable.

18.3. Nishino teaches calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

18.3.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

18.4. Nishino further teaches storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

18.4.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that current values of the generation source are stored.

18.5. Nishino further teaches calculating currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

18.5.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

18.6. Nishino further teaches calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST9**(refer to following subsection), and **column 11, lines 32 – 35**).

18.6.1. Regarding **Figure 5, elements ST9**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

18.7. Nishino further teaches outputting the receiving characteristic of the object (**Figure 5, elements ST9, and 21**, and **column 11, lines 35 – 36**).

18.8. Nishino does not teach expressly calculating current values of a radio wave generation source *using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

18.9. Nishino also does not teach expressly calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements *and a positional relationship between the generation source and object changes*, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants.

18.10. Nishino also does not teach expressly *that the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated.*

18.11. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

18.12. Otsu teaches calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

18.12.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

18.13. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (pages 632 – 634, section 11-6.1).

18.14. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (section 11-6.1, page 633), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104), and current values of the receiving characteristic of an object can be calculated separately (page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104).

18.15. Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

18.16. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

18.17. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a computer-readable storage medium on which was recorded a program for a computer to execute, the process comprising:

18.17.1. Calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

18.17.2. Storing the current values of the generation source.

18.17.3. Calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the stored current values as constants.

18.17.4. Calculating the receiving characteristic of the object based on the current values of the object.

18.17.5. Outputting the receiving characteristic of the object.

18.18. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (page 634, figure 11-18).

18.19. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 7.

19. Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

19.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

19.2. Nishino teaches a memory medium storing a computer program (**column 30, line11**).

19.2.1. Regarding **column 30, line11**, it is obvious that the medium is computer-readable.

19.3. Nishino teaches calculating current values (**Figure 4, element 12**, and **column 7, lines 7 - 9**, and **Figure 5, element ST5**, and **column 10, lines 23 - 25**) of a radio wave generation source (**column 7, lines 16 - 20**).

19.3.1. Regarding **column 7, lines 16 - 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

19.4. Nishino further teaches storing the current values of the generation source (**Figure 5, element ST7**(refer to following subsection)).

19.4.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that current values of the generation source are stored.

19.5. Nishino further teaches calculating currents in an object that receives a radio wave (**Figure 19, element Housing**(refer to following subsection)) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 - 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants (**Figure 5, element ST7**, and **column 10, lines 56 - 64**).

19.5.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

19.6. Nishino further teaches calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST9**(refer to following subsection), and **column 11, lines 32 - 35**).

19.6.1. Regarding **Figure 5, elements ST9**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

19.7. Nishino further teaches outputting the receiving characteristic of the object (**Figure 5, elements ST9, and 21**, and **column 11, lines 35 – 36**).

19.8. Nishino does not teach expressly calculating current values of a radio wave generation source *using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

19.9. Nishino also does not teach expressly calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements *and a positional relationship between the generation source and object changes*, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants.

19.10. Nishino also does not teach expressly *that the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated.*

19.11. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

19.12. Otsu teaches calculating current values of a radio wave generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

19.12.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

19.13. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

19.14. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the receiving characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

19.15. Otsu, Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

19.16. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

19.17. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and and Cheng and Nishino to produce a process comprising:

19.17.1. Calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

19.17.2. Storing the current values of the generation source.

19.17.3. Calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the stored current values as constants.

19.17.4. Calculating the receiving characteristic of the object based on the current values of the object.

19.17.5. Outputting the receiving characteristic of the object.

19.18. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device **(Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11)**, which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately ***(page 634, figure 11-18)***.

19.19. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 8.

20. Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Nagase et al (U.S. Patent 5,812,434), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

20.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

20.2. Nishino teaches preserving the current values of a radio wave generation source **(Figure 5, elements ST5 and ST7** (refer to following subsection), and **column 6, lines 57 – 63)**.

20.2.1. Regarding **Figure 5, elements ST5 and ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that the current values of the generation source are preserved.

20.2.2. Regarding **column 6, lines 57 – 63**, since the wave source induces a current in the inapplicable section, the wave source is a radio wave generation source.

20.3. Nishino teaches generating simultaneous equations of an object that receives a radio wave (**Figure 19, lines 39 – 60**) according to a position of the object when the object is divided into a plurality of elements (**Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the preserved current values as constants (**Figure 5, element ST7**);

20.3.1. Regarding **Figure 19, lines 39 – 60**, since the current through the patch is based on a wave source transmitting radio waves, the patch is an object that receives radio waves.

20.3.2. Regarding **Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**, it was well known that in the moment method, an object is divided into a plurality of elements.

20.3.3. Regarding **Figure 5, elements ST6 and ST7**, and **column 10, lines 46 – 64**, the mutual impedance between the "m" sections for the moment method and "n" sections for the distributed constant circuit is calculated according to the position of the object.

20.4. Nishino teaches calculating current values of the object corresponding to the position of the object using the simultaneous equations of the object (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

20.4.1. Since the current values of the object are calculated using the simultaneous equations generated by position (refer to the preceding section), the current values are calculated corresponding to the position of the object.

20.5. Nishino teaches calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST7**, and **column 11, lines 19 – 21**).

20.5.1. Regarding **Figure 5, elements ST7**, and **column 11, lines 19 – 21**, since the current is a property of the receiving object, it is a receiving characteristic.

20.6. Nishino does not teach expressly *a simulation method*.

20.7. Nishino also does not teach expressly *generating simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

20.8. Nishino also does not teach expressly *calculating current values of the generation source using the simultaneous equations of the object*.

20.9. Nishino also does not teach expressly the receiving characteristic of the object on an output device.

20.10. Nishino also does not teach expressly *that the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation*

source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated.

20.11. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

20.12. Otsu teaches a simulation method (**column 28, line 32**).

20.13. Otsu teaches a current calculation device calculating current values of the generation source using simultaneous equations of the genèration source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

20.13.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

20.14. The art of Nagase is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

20.15. Nagase teaches outputting calculated currents of an object on an output device (**Figure 8, elements S16, 40, and S20**, and **column 10, lines 32 – 36**).

20.16. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

20.17. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the receiving characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

20.18. Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

20.19. Otsu, Nagase, and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

20.20. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu, Nagase, Cheng and Nishino to produce a simulation method for simulating a receiving characteristic of an object that receives a radio wave transmitted from a radio wave generation source, comprising:

20.20.1.1. Generating simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns;

20.20.1.2. Calculating current values of the generation source using the simultaneous equations of the object;

20.20.1.3. Preserving the current values of the generation source;

20.20.1.4. Generating simultaneous equations of the object according to a position of the object when the object is divided into a plurality of elements, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the preserved current values as constants;

20.20.1.5. Calculating current values of the object corresponding to the position of the object using the simultaneous equations of the object;

20.20.1.6. Calculating the receiving characteristic of the object based on the current values of the object; and

20.20.1.7. outputting the receiving characteristic of the object on an output device; and.

20.20.1.8. wherein the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated.

20.21. The motivation for combining the art of Otsu and Nagase with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit, and the expectation of a benefit stated in Nagase that a detailed visual indication of currents is very important to understand the mechanism of the radiation of electromagnetic waves (**column 2, lines 55 – 58**). The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (**page 634, figure 11-18**).

20.22. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu, Cheng and Nagase with the art of Nishino for the benefit of obtaining the invention as specified in claim 9.

21. Claim 10 is rejected under 35 U.S.C. 103(a) as being obvious over Nishino et al (U.S. Patent 5,650,935) in view of Otsu et al (U.S. Patent 5,903,477), further in view of Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng).

21.1. The art of Nishino is directed to calculation of the intensity of an electromagnetic field generated by an electronic device.

21.2. Nishino teaches a first current calculation device calculating current values (**Figure 4, element 12**, and **column 7, lines 7 – 9**, and **Figure 5, element ST5**, and **column 10, lines 23 – 25**) of a radio wave generation source (**column 7, lines 16 – 20**).

21.2.1. Regarding **column 7, lines 16 – 20**, since the current in the applicable sections induces a wave source, the applicable sections are a radio wave generation source.

21.3. Nishino further teaches a current storage device storing the current values of the generation source (**Figure 5, element ST7** (refer to following subsection)).

21.3.1. Regarding **Figure 5, element ST7**, since the process flow in Figure 5 displays that the calculated current values in element ST5 are used in the calculations of element ST7, it is obvious that a current storage device is included that stores the current values of the generation source.

21.4. Nishino further teaches a calculation of currents in an object that receives a radio wave (**Figure 19, element Housing** (refer to following subsection)) by a second current calculation device calculating current values of the object (**Figure 4, element 13**, and **column 7, lines 10 – 12**, and **Figure 5, element ST7**, and **column 11, lines 19- 21**) using simultaneous equations of the object when the object is divided into a plurality of elements (**Figure 5, element ST7**, and **column 11, lines 19- 21**, and **Figure 5, element ST6**, and **column 10, lines 46 – 51**), the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants (**Figure 5, element ST7**, and **column 10, lines 56 – 64**).

21.4.1. Regarding **Figure 19, element Housing**, in Figure 19, element Housing is an object that receives a radio wave.

21.5. Nishino further teaches an output device calculating the receiving characteristic of the object based on the current values of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 32 – 36**), the receiving characteristic being calculated at multiple positional relationships from the generation

source, and outputting the receiving characteristic of the object (**Figure 5, elements ST8, ST9, and 21**(refer to following subsection), and **column 11, lines 22 – 36**).

21.5.1. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is a property of the currents in the receiving object, it is a receiving characteristic.

21.5.2. Regarding **Figure 5, elements ST8, ST9, and 21**, since the electric/magnetic field is being calculated at multiple observation points, it is obviously being calculated at multiple positional relationships from the generation source.

21.6. Nishino further teaches a means for calculating as a computer implemented calculation apparatus for calculating (**column 12, lines 11 – 12**).

21.7. Nishino further teaches a means for output (**column 12, line 37**).

21.8. Nishino further teaches a means for storing (**column 11, line 66**).

21.9. Nishino does not teach expressly *a simulation apparatus*.

21.10. Nishino does not teach expressly a first current calculation means for calculating current values of a radio wave generation source *using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns*.

21.11. Nishino also does not teach expressly a second current calculation means for calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements *and a positional relationship between the generation source and object changes*, the simultaneous equations of the

object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants.

21.12. Nishino also does not teach expressly that _the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object is separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated._

21.13. The art of Otsu is directed to calculating the intensity of an electromagnetic field generated by an electronic device.

21.14. Otsu teaches a simulation apparatus (**column 23, line 31**).

21.15. Otsu further teaches a current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements (**column 5, lines 54 – 58**(refer to following subsection), and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**), the simultaneous equations of the generation source having currents that flow through respective elements as unknowns (**column 5, lines 54 – 58**, and **Figure 45, boxes labeled "calculation of mutual impedance" and "simultaneous equation for calculation of current"**).

21.15.1. Regarding **column 5, lines 54 – 58**, it was well known that in the moment method, a generation source is divided into a plurality of elements.

21.16. The art of Cheng is directed to calculating an electromagnetic field generated by a generating wave source (**pages 632 – 634, section 11-6.1**).

21.17. Cheng teaches the limitation that under normal circumstances, transmitting and receiving antennas are separated by very large distances, and the coupling impedances are negligibly small as far as the reaction on the transmitting antenna owing to scattering by the receiving antenna is concerned (**section 11-6.1, page 633**), which means that currents in the transmitting antenna can be calculated separately without regard for the currents in the receiving antenna and the current values in the transmitting antenna are regarded as constants (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**), and current values of the receiving characteristic of an object can be calculated separately (**page 634, figure 11-18; and page 633, entire page; and page 634, first paragraph and equation 11-104**).

21.18. Cheng and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by a generating wave source.

21.19. Otsu and Nishino are analogous art because they are directed to a similar problem solving area, that of calculating an electromagnetic field generated by an electronic device.

21.20. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a first current calculation means for calculating current values of the generation source using simultaneous equations of the generation source when the generation source is

divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns.

21.21. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a current storage means for storing the current values of the generation source.

21.22. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce a second current calculation means for calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through the respective elements as unknowns and the current values stored in the current storage device as constants.

21.23. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Otsu and Cheng and Nishino to produce an output means for calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object.

21.24. At the time of the invention, it further would have been obvious to a person of ordinary skill in the art to use the teachings of Cheng and Nishino to separate the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object by regarding the current values of the radio wave generation source as constants, and separately calculate the current

values of the radio wave generation source and the current values of the receiving characteristic of the object.

21.25. The motivation for combining the art of Otsu with the art of Nishino would have been obvious in view of the common suggestion in both Otsu and Nishino of the ability to calculate at a high speed the electromagnetic fields radiated from an electronic device (**Otsu, column 1, lines 8 – 15**, and **Nishino, column 1, lines 8 – 11**), which would have provided the expectation of a computational benefit. The motivation for combining the art of Cheng with the art of Nishino would have been obvious in view of the calculation benefit shown in Cheng that the currents in the transmitting and receiving antennas can be calculated separately (**page 634, figure 11-18**).

21.26. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Otsu and the art of Cheng with the art of Nishino for the benefit of obtaining the invention as specified in claim 10.

22. **Claim 11** is rejected under 35 U.S.C. 102(b) as being anticipated by Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng), in view of Nishino (U.S. Patent Number 5,650,935).

22.1. Cheng appears to teach calculating current values of a source ***(page 634, figure 11-18; and page 633, equation 11-100)***.

22.1.1. Regarding ***(page 634, figure 11-18; and page 633, equation 11-100)***; it would have been obvious to the ordinary artisan at the time of invention to calculate the current values of the source by dividing V_1 by Z_{11}.

22.2. Cheng appears to teach storing the current values as constants ***(page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634)***.

22.2.1. Regarding ***(page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634)***; it would have been obvious to the ordinary artisan at the time of invention to store the current values as constants since the value of I_1 is merely substituted into equation 11-104, while the value of Z_L can be changed to calculate a new I_2.

22.3. Cheng appears to teach calculating current values of the object using the constants ***(page 634, equation 11-104; and page 634, figure 11-18)***.

22.3.1. Regarding ***(page 634, equation 11-104; and page 634, figure 11-18)***; the value of I_1 in equation 11-104 is the constant determined in the previous step.

22.4. Cheng does not specifically teach outputting the receiving characteristic of the object on an output device.

22.5. Nishino appears to teach outputting the receiving characteristic of the object on an output device (***figure 5, element ST9 outputting to element 21***).

22.6. The motivation to use the art of Nishino with the art of Cheng would have been suggested by the nature of the problem, as it was commonly known by the ordinary artisan to output values from a calculation in order to make use of the results of the calculation.

22.7. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Nishino with the art of Cheng for the benefit of obtaining the invention as specified in claim 11.

23. **Claim 12** is rejected under 35 U.S.C. 102(b) as being anticipated by Cheng ("Field and Wave Electromagnetics", 1989, David K. Cheng), in view of Nishino (U.S. Patent Number 5,650,935).

23.1. Cheng appears to teach calculating current values of a source ***(page 634, figure 11-18; and page 633, equation 11-100)***.

23.1.1. Regarding ***__(page 634, figure 11-18; and page 633, equation 11-100)__***; it would have been obvious to the ordinary artisan at the time of invention to calculate the current values of the source by dividing V_1 by Z_{11}.

23.2. Cheng appears to teach storing the current values as constants ***__(page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634)__***.

23.2.1. Regarding ***__(page 634, equation 11-104; and page 634, figure 11-18; and pages 633 - 634)__***; it would have been obvious to the ordinary artisan at the time of invention to store the current values as constants since the value of I_1 is merely substituted into equation 11-104, while the value of Z_L can be changed to calculate a new I_2.

23.3. Cheng appears to teach calculating current values of the object using the constants ***__(page 634, equation 11-104; and page 634, figure 11-18)__***.

23.3.1. Regarding ***__(page 634, equation 11-104; and page 634, figure 11-18)__***; the value of I_1 in equation 11-104 is the constant determined in the previous step.

23.4. Cheng appears to teach changing a relative position of the object and the source ***__(page 632, figure 11-16; and page 632, section 11-6.1, first paragraph)__***.

23.5. Cheng appears to teach calculating current values of the object with the changed relative position using the constants ***__(page 632 –634, section 11-6.1; and page 634, figure 11-18; and page 634, equation 11-104)__***.

23.6. Cheng does not specifically teach outputting the receiving characteristic of the object on an output device.

23.7. Nishino appears to teach outputting the receiving characteristic of the object on an output device (***__figure 5, element ST9 outputting to element 21__***).

23.8. The motivation to use the art of Nishino with the art of Cheng would have been suggested by the nature of the problem, as it was commonly known to the ordinary

artisan to output values from a calculation in order to make use of the results of the calculation.

23.9. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Nishino with the art of Cheng for the benefit of obtaining the invention as specified in claim 12.

Conclusion

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell L. Guill whose telephone number is 571-272-7955. The examiner can normally be reached from 10:00 AM – 6:30 PM Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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